Space Weather Forecast

Issued on Sunday, 17 September 2023 at 01:24 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: A large centre-disc eruption observed early on 16th Sept produced an Earth-directed CME, likely to arrive on the 19th September, with likely G1-G2 minor/moderate storms. G1-G2 Likely early UTC day of Sunday. Chance of further G1 on Monday. Chance R1 Minor Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Moderate in the past 24 hours, with two Moderate-class flares observed from an active sunspot region near centre-disc. There are currently seven sunspots regions on the disc, with the region centre-disc the most active, although there are now signs of an arriving region in the far east, which will need to monitored as it rotates further onto the visible disc, with another region in the west rotating off disc. The majority of the activity has occurred from the region near centre-disc, which contains a 'delta' spot in its intermediate portion. This was very mobile in the period with its constituent parts well-formed and essentially orbiting each other at close quarters. Other spots on the disc were largely unremarkable, although the new eastern arrival did produce a mid-ranking Common-class flare to perhaps hint at a degree of potential here.

A large "filament' (arc of plasma) which has dominated the central-north part of the Sun was seen to finally leave the disc during the early UTC morning of 16 September, perhaps destabilised by the suite of Moderate-class flares from its unruly southern sunspot group neighbour. This produced a halo Coronal Mass Ejection (CME), which has been analysed using coronagraph imagery, with the bulk of the 'plasma' material seen to be heading towards the south and west. Early results from this analysis suggest an arrival at Earth during the UTC day of 19 September (Day 3). However, further analysis is currently on-going of this event, so these details may change.

The only other CME visible in the period was a high-latitude feature apparently heading northeast. There is no obvious front-sided source and this is perhaps far-sided, although full analysis has yet to be conducted. No other CMEs were observed in the past 24 hours.

Solar Wind / Geomagnetic Activity: Solar wind parameters are perhaps now thought most likely to be explained as the fast wind from a 'coronal hole', with a possible onset having occurred on Thursday 14 September. This is not a conclusive diagnosis, and there is a small chance of a fast wind arriving within the current UTC day, however this now appears unlikely.
The solar wind speed was at Slightly Elevated levels throughout the period, with a steady decline. The magnetic field was weak, with the all important north-south component variable, but also weak. The net result of the above solar wind measures was for provisionally Quiet to Unsettled geomagnetic activity, with a peak of Unsettled (Kp 3) in the 18-21UTC interval.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

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Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of Moderate-class X-ray flares, mainly from the complex sunspot group near the middle of the Sun. A group on the western solar horizon should leave the Earth-facing side over the current UTC weekend, but the flare risk may be maintained by the return of another group in the east.

Solar Wind / Geomagnetic Activity: The geomagnetic forecast is of lower than average confidence. The large 'filament eruption' CME of the current UTC day is awaiting imagery and does not yet feature. Therefore, the main forecast elements are the 14/0745UTC CME (especially), and to a lesser extent the 14/2126UTC CME.

The large filament (arc of plasma) eruption which occurred early on the UTC day of 16 Sept, produced a halo CME, which has been provisionally analysed and latest modelling suggests an arrival at Earth during the UTC day of 19 September (Day 3). However, please note, further analysis is on-going to firm up on the detail for this event. Therefore, the main forecast elements are the 14/0745UTC CME (especially), and to a lesser extent the 14/2126UTC CME.

Quiet initial conditions will Likely evolve to G1/Minor geomagnetic storm within the next 24 hours, receding into the new working week to be replaced by a further Chance of G1 during Monday morning UTC. The filament eruption, which produced the halo CME (mentioned above) is Likely to arrive on 19 September (Day 3) with G1-G2/Minor-Moderate Storm likely and a Slight Chance of G3/Strong storm, which may last into the early UTC of 20 September (Day 4), before waning.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with a daily Slight Chance of an enhancement should any larger flares occur.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	30	70	50
Strong	G3	No	1	5	20	10
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	50	50
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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